

1 1. (AMENDED) A microelectromechanical device, comprising  
2 a. a rotating element including a first electrode;  
3 b. a vertical stop disposed proximate the rotating  
4 element;  
5 c. a second electrode;  
6 d. means, coupled to the first and second electrodes for  
7 measuring a capacitance between them; and  
8 e. means coupled to the capacitance sensing means for  
9 determining from the capacitance a digital control  
10 state of the device.

1 6. (AMENDED) A microelectromechanical system (MEMS) apparatus,  
2 comprising  
3 a. an element configured to rotate between a first  
4 control state and a second control state;  
5 b. a vertical stop disposed proximate the element;  
6 c. one or more electrodes disposed proximate the  
7 element, wherein a capacitance between the element  
8 and the one or more electrodes has a first value when  
9 the element is in the first control state and the  
10 capacitance has a second value when the element is in  
11 the second control state;  
12 d. means, for measuring a value of the capacitance  
13 between the element and the at least one of the one  
14 or more electrodes; and  
15 e. means coupled to the capacitance sensing means for  
16 determining a control state of the element from the  
17 value of the capacitance.

1 16. (AMENDED) A method for sensing the control state of a  
2 microelectromechanical device, comprising:  
3 measuring a value of a capacitance between a rotatable  
4 element and one or more of a first and second electrode  
5 disposed proximate the rotatable element to determine  
6 whether the rotatable element is in a first control

7 state, a second control state, or neither the first nor  
8 second control state,  
9 wherein the rotatable element is in a vertical position  
10 proximate a vertical stop when the rotatable element is in  
11 the first or second control state.

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1 22. (AMENDED) An optical communications system, comprising:  
2 a) one or more input optical fibers;  
3 b) one or more output optical fibers;  
4 c) a microelectromechanical system (MEMS) optical  
5 switch including:  
6 ii) one or more MEMS mirrors configured to rotate  
7 between a first angular position and a second  
8 angular position;  
9 ii) b. a vertical stop disposed proximate one or  
10 more of the MEMS mirrors;  
11 iii) one or more electrodes disposed proximate each  
12 of the one or more mirrors, wherein a  
13 capacitance between the mirrors and the  
14 electrodes has a first value when the mirrors  
15 are in a first control state and the  
16 capacitance has a second value when the element  
17 is in a second control state;  
18 iv) means, for measuring a value the capacitance  
19 between at least one of the one or more mirrors  
20 and the at least one of the one or more  
21 electrodes; and  
22 v) means coupled to the capacitance sensing means  
23 for determining a control state of the element  
24 from the value of the capacitance.

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**REMARKS:**

DRAWINGS

The Applicants are submitting formal drawings to the Official Draftsperson concurrently with this response. Copies of the  
5 formal drawings are enclosed for the Examiner's convenience.

CLAIM AMENDMENTS

The Applicants have amended claims 1, 6, 16 and 22 to recite the use of a vertical stop. Support for this feature can be found in the specification at page 7, lines 20-34 and Figs. 3  
10 and 4a. As such, no new matter has been entered with this amendment. Furthermore, the Applicants submit that this feature may be regarded as an added element. As such, no element of any claim has been narrowed within the meaning of the decision in *Festo Corporation v. Shoketsu Kinzoku Kogyo*  
15 *Kabushiki Co., Ltd* (234 F.3d 558).

The applicants have also amended claim 6 to correct minor matters of form. Specifically, in part c (formerly part b) the applicants have changed "the electrode" -- the one or more electrodes-- to be consistent. The applicants have also  
20 changed "angular position" to "control state" to use consistent language. The Applicants have also amended claim 6 to insert -of-between "value" and "the capacitance" in part d (formerly c). Since these corrections are directed to matters of form, the Applicants submit that no element claim of claim 6 has been  
25 narrowed by these particular amendments. Furthermore, the Applicants submit that, because the amendments are directed to

matters of grammar and style, claim 6 was not amended for any reason related to patentability within the meaning of the decision in *Festo*.

The Applicants have also revised claim 16 to remove parts a and  
5 b. The Applicants submit that reciting providing a rotatable element and disposing electrodes proximate the element unnecessarily limits the scope of a claim for a method for sensing the control state of a micromechanical device. The other changes to the rest of the claim (formerly part c) merely make  
10 explicit that which was implicit in the claim as originally filed. As such, the section in claim 16 immediately preceding the "wherein" clause has not been narrowed within the meaning of the decision in *Festo*.

#### CLAIM REJECTIONSS

15 35 USC 112

The Examiner has rejected claim 19 under 35 U.S.C. § 112, second paragraph, as being incomplete for omitting essential elements, such omission amounting to a gap between the elements. The Examiner cites the claim language "the clamping voltage and a  
20 sensing signal are alternatively [sic] applied in time" to the electrodes. The Examiner argues that temporary termination of the clamping voltage would result in unstable positioning of the mirror, which contradicts the stated goal of providing the mirror with two stable states. The Examiner concludes that the  
25 Applicants have omitted an essential element, namely retaining a

holding value of the electrode voltage while terminating an attracting voltage applying a sensing signal.

The Applicants respectfully traverse the rejection. The Applicants submit that the Examiner has failed to point to any specific statement in the specification supporting his assertion that a stated goal of the invention is providing the mirror with two stable states. Indeed, the "Objects and Advantages" section of the specification (at page 4, lines 2-5) states, in its entirety:

10       "Accordingly, it is a primary object of the present invention to provide microelectromechanical system (MEMS) device having a fault detection system that directly measures mirror control state."

The Examiner has cited MPEP 2171.02 in support of his rejection of claim 19. MPEP 2171.02 states that a "claim which omits matter disclosed to be essential to the invention as described in the specification or in other statements of record may be rejected under 35 U.S.C. 112, first paragraph, as not enabling." MPEP 2171.02 makes reference to MPEP 2164.08(c), which states, inter alia, "In determining whether an unclaimed feature is critical, the entire disclosure must be considered. Features which are merely preferred are not to be considered critical. In *re Goffe*, 542 F.2d 564, 567, 191 USPQ 429, 431 (CCPA 1976)."

Furthermore, MPEP 2164.08(c) states that a rejection based on an omitted element requires a clear statement in the specification that the allegedly omitted element is critical:

"Limiting an applicant to the preferred materials in the absence of limiting prior art would not serve the constitutional purpose of promoting the progress in the useful arts. Therefore, an enablement rejection based on the grounds that a disclosed critical limitation is missing from a claim should be made only when the language of the specification makes it clear that the limitation is critical for the invention to function as intended. *Broad language in the disclosure, including the abstract, omitting an allegedly critical feature, tends to rebut the argument of criticality.* [emphasis added]

The Applicants submit that the statement in the "Objects and Advantages" section of the specification makes no mention whatsoever of the alleged omitted element and states in rather broad terms that the invention is directed to providing a MEMS device with a fault detection system that directly measures control state. This is exactly the type of "broad language in the disclosure...omitting an allegedly critical feature" that tends to rebut the Examiner's argument of criticality.

Thus, in the light of the language of the disclosure, and in the absence of any showing of a statement within the specification tending to support the criticality of providing two stable states, the Applicants submit that no critical element has been omitted and the rejection of claim 19 is improper. The Applicants therefore, respectfully request that the Examiner withdraw the rejection of claim 19.

35 USC 103

The Examiner has rejected claims 1-22 under 35 U.S.C. § 103(a) as being obvious over U.S. Patent 6,396,976 to Little et al.

(hereinafter Little) in view of European Patent Publication 0,683,414 to Netzer (hereinafter Netzer). In making the rejections, the Examiner states that Little discloses a rotating element including a first electrode and a second electrode but  
5 not a means for measuring a capacitance between them. The Examiner also states that Little does not disclose a means for determining a control state of the device from the capacitance. The Examiner argues that Netzer discloses means for measuring the capacitance between electrodes for determining a position of a  
10 microactuator. The Examiner further states that Netzer's results were presented in a way suitable for digital interpretation. The Examiner argues that since both Little and Netzer deal with providing electrostatically activated optical switches, it would have been obvious to use the capacitive position sensing of  
15 Netzer in the array of micromachined mirrors of Little.

The Applicants respectfully traverse the rejection on the grounds that a prima facie case of obviousness is not present. Specifically, the Applicants have amended claims 1, 6, 16 and 22 so that they specifically recite a vertical stop. Although  
20 Little does teach the use of a stop in the "Background of the Invention" section (see col. 2, lines 51-53), it is clear from the rest of Little that the use of such a stop is to be avoided. Little specifically states that the use of such a stop is undesirable because of stiction forces between the mirror and the  
25 stop (see col. 2, lines 54-64). Little further states that the "combination of a mechanical stop, bulk processing and manual

assembly of the mirror and counter electrode substrates limits the precision of the mirror deflection angle in the ON-state." (see col. 2 line 65 to col. 3, line 3). Little's optical switch avoids the use of a stop entirely. Instead Little uses two electrodes 40, 42 disposed above a mirror 12 to provide electrostatic forces that allow for fine-tuning of the mirror position (see Figs. 3a, 3b and col. 4, line 50 to col. 5, line 18). The Applicants submit that Netzer neither teaches nor suggests the use of a vertical stop as recited in claims 1, 6, 16 and 22. Even if Netzer included such a teaching or suggestion, the overall combination of Little with Netzer would teach that the use of a stop is undesirable when capacitively determining the control state of a rotating element. As such, the combination of Netzer with Little simply does not teach, and teaches away from, the invention as recited in independent claims 1, 6, 16 and 22.

Furthermore, any such teaching would tend to defeat the purpose of the invention in Little, which is to avoid the use of a stop. Therefore, the combination of these two references would destroy the function of the invention in Little. Thus there would be no technological motivation for combining them. As such these two references are not properly combinable and a prima facie case of obviousness cannot properly be made regarding the applicant's invention. See *in re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984).



Therefore, for the reasons set forth above, a prima facie case of obviousness is not present and independent claims 1, 6, 16 and 22 define an invention suitable for patent protection. Furthermore, dependent claims 2-5, 7-15, and 17-21 respectively depend, either  
5 directly or indirectly, from claims 1, 6 and 16. As such, and for the reasons set forth above with respect to claims 1, 6, 16 and 22, the Applicants submit that these dependent claims define an invention suitable for patent protection.

Furthermore, it is clear from the above discussion that the  
10 combination of Little with Netzer specifically teaches away from the use of a vertical stop that is part of a substrate to which a rotatable element is attached as recited in claim 13.

Furthermore, claim 16 has been amended to specifically recite that the rotatable element is in a vertical position proximate a  
15 vertical stop when the rotatable element is in the first or second control state. The combination of Little with Netzer clearly teaches that such a situation is undesirable. Thus, for the reasons stated above, the combination of Little with Netzer teaches away from claim 16 *a fortiori*.

20 Furthermore, neither Little nor Netzer teaches or suggests applying the clamping voltage and a sensing signal alternately in time as recited in claim 19. As such no combination of Little with Netzer teaches all the limitations of claim 19.

For at least these additional reasons, the Applicants submit that  
25 claims 13, 16 and 19 are unobvious over the combination of Little

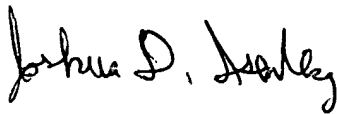
with Netzer. Thus, claims 13, 16 and 19 define an invention suitable for patent protection.

CONCLUSION

In view of the above amendments and remarks, the Applicants  
5 submit that all pending claims are allowable over the prior art of record. Therefore, the Applicants respectfully request that the Examiner reconsider the application and issue a Notice of Allowance in the next Office Action.

Respectfully submitted,

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Joshua D. Isenberg  
Patent Agent, Reg. No. 41,088

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JDI PATENT  
204 Castro Lane  
Fremont, CA 94539  
tel.: 510-896-8328  
fax: 510-360-9656